## CHARTING SIMULTANEOUS OBSERVATIONS.

The dates pertaining to the simultaneous observations at Greenwich noon are Greenwich dates and not local time dates. They do not change as the vessel moves from point to point, east or west. Vessels sailing eastward, or in the same direction as the earth's rotation, have local days that are longer than Greenwich days; those sailing westward have shorter local days. On the east going vessels crossing the Pacific there must be one local day on which there will be two Greenwich noon observations. On west going vessels there will be a local day so short that it will have no Greenwich noon observation. These days will be those on which the vessel crosses the one hundred and eightieth meridian.

Observers and students should bear in mind the following information:

In order to avoid confusion in charting meteorological data on the Pacific Ocean, it is necessary to keep in mind the rules adopted for fixing the dates, viz, the days of the week, the month, and the year. The residents of the islands in the Pacific keep their records on dates that accord with the usage of neighboring islands with which they are in commercial intercourse. On July 4, 1892, King Malietoa ordered that the American date, instead of the Australian date, should be kept throughout the Samoan Islands. Other islands had made similar changes at previous dates; thus, on December 31, 1844, the American date was abolished in the Philippine Islands and the European date adopted. At the present time the islands of the Pacific keep their dates as shown in the following list, which is taken from the Pilot Chart published September 1, 1899, by the United States Hydrographic Office:

American dates: Alaska, St. Lawrence Island, all the Aleutian Islands, Morell Island, Phœnix Islands, Samoan Islands.

Asiatic dates (one day later than the American dates): Siberia, Kamchatka, Copper Island, Marshall Islands, Gilbert Islands, Ellice Islands, Fiji Islands, Friendly Islands, New Zealand, Chatham Island.

When it is Saturday the first day of the month on the eastern or American side of this date line it is Sunday, or the second day of the month, on the western or Asiatic side, and this is true at any hour of the day or night.

In this connection the following instructions relative to simultaneous observations were lately issued by the United States Hydrographic Office:

In crossing the one hundred and eightieth meridian, observers aboard westward bound vessels sometimes make the mistake of dropping a day from the record of the Greenwich mean noon observations, and conversely of using the same date twice when eastward bound. This is incorrect. The observations in both cases should be dated consecutively, as a little consideration will show.

Take a case of a westward bound vessel making four degrees of longitude per day, and suppose her longitude at Greenwich mean noon of April 15 is 178° west. The local date and time of the observation is April 15, 0 h. 8 m. a. m. The local time of the next observation will be 23 h. 44 m. later than this, or (disregarding the change of date) April 15, 11 h. 52 m. p. m.; but advancing this date for the change from west to east longitude gives for the true local date and time of the observations April 16, 11 h. 52 m. p. m.

Again, let the vessel be eastward bound, and suppose her longitude at Greenwich mean noon of April 15 be 178° east. The local date and time of the observation is April 15, 11 h. 52 m. p. m. The local time of the next observation will be 24 h. 16 m. later than this, or (disregarding the change of date) April 17, 0 h. 8 m. a. m.; but setting back this date for the change from east to west longitude gives for the true local date and time of the observation April 16, 0 h. 8 m. a. m.

## THE SEASON OF VEGETATION.

In the MONTHLY WEATHER REVIEW for February, 1901, page 55, Mr. Henry Pennywitt has given charts showing the natural division of the year into the colder and warmer half. In general, the warmer half is that portion of the year in which the average daily temperatures are above the normal average annual temperature. Presumably, all the growth of crops (except winter wheat) must take place within this warm season; in fact, for delicate vegetation, it must take place within a much shorter period, viz: the interval between the last frost of spring and the first of autumn. Tables and charts showing the average date of the last killing frost of spring and the first of autumn were published in Volume XVI MONTHLY WEATHER REVIEW, pages 51 and 165, respectively. The latest publication of this data as revised is to be found in the Year Book of the Department of Agriculture, 1897, page 618. According to these charts, we should have for Fargo, N. Dak., near Moorhead, Minn., the dates May 15 for the latest spring frost and September 15 for the earliest autumn. A recent bulletin of the experiment station for North Dakota, which is located at Fargo, says:

The temperature which registers 26° F. has been taken as representing what is commonly known as killing frost. The following table gives the record of killing frosts during the past eight years at the experiment station at Fargo and the accompanying minimum temperature.

| Year. | Last killing spring frosts. | | First killing autumn frosts. | | Interval between killing frosts. |
|---|---|---|---|---|---|
| | Date. | Minimum temperature. | Date. | Minimum temperature. | |
| | | °F. | | °F. | Days. |
| 1894 | April 15 | 21.5 | Sept. 17 | 20 | 155 |
| 1895 | May 21 | 20 | Sept. 30 | 21 | 132 |
| 1896 | ........ | ........ | ........ | ........ | ........ |
| 1897 | June 7 | 26 | Oct. 9 | 12 | 124 |
| 1898 | May 11 | 21 | Sept. 9 | 24 | 121 |
| 1899 | May 14 | 23 | Sept. 29 | 17 | 138 |
| 1900 | May 9 | 25 | Sept. 17 | 26 | 131 |
| 1901 | April 22 | 25 | Sept. 18 | 23 | 149 |
| Average | May 10 | ........ | Sept. 23 | ........ | 136 |

The following table gives similar data for the light frosts:

| Year. | Last light spring frosts. | | First light autumn frosts. | | Interval between light frosts. |
|---|---|---|---|---|---|
| | Date. | Minimum temperature. | Date. | Minimum temperature. | |
| | | °F. | | °F. | Days. |
| 1894 | May 19 | 31 | Sept. 11 | 29 | 115 |
| 1895 | May 26 | 29 | Aug. 31 | 30.5 | 97 |
| 1896 | ........ | ........ | ........ | ........ | ........ |
| 1897 | June 7 | 26 | Sept. 17 | 20 | 102 |
| 1898 | May 16 | 30 | Sept. 8 | 27 | 115 |
| 1899 | May 18 | 30 | Sept. 18 | 9 | 118 |
| 1900 | May 9 | 25 | Sept. 17 | 26 | 131 |
| 1901 | June 7 | 30 | Sept. 18 | 23 | 103 |
| Average | May 23 | ........ | Sept. 12 | ........ | 111 |

From the above tables it will be seen that the interval between killing frosts has varied between one hundred and twenty-one and one hundred and fifteen days, while the interval between light frosts has varied between ninety-seven and one hundred and thirty-one days. The average date for the latest light frost is thirteen days later than the latest killing frost in the spring and eleven days earlier in the autumn. The relation of these dates to the maturing of the crops depends largely upon the plant under consideration. Thus, wheat that was sown sometime between April 14 and May 8 matured in from eighty-three to one hundred and twenty-three days during the eight years under consideration, the average being one hundred; that is to say, it was sown before the last killing frost of spring and matured from ten to thirty days before the first killing frost of autumn. Oats sown between April 8 and May 19 matured in from eighty to one hundred and fourteen days, depending, of course, upon the character of the summer, the average being ninety-five, and always before the dates of killing frosts. Barley sown between April 3 and May 21 matured in from seventy-one to one hundred and eleven days, the average being eighty-eight. Flax sown between May 3 and June 10 matured in from seventy-seven to one hundred and nine days, the average being eighty-nine. Millet sown between May 31 and June 8 matured in from sixty-six to one hundred and forty-two days, the average being ninety-six. Spelt sown between April 25 and May 10 matured in from eighty-six to ninety-six days, the average being ninety-two.

## VOLCANIC DUST.

In accordance with the circular of May 27, 1902, Mr. M. B.

Stubbs, Observer United States Weather Bureau, Santo Domingo, reports:

While in the harbor of Monte Christo, Captain Garvin, of the Clyde Line, was told by the captain of the Norwegian bark, *Linnea*, that in running from Bahia, Brazil, for Barbados he got too far west and made St. Lucia. He then beat to the northward and on Sunday, May 11, was within 15 miles of Martinique, which, however, he could not see as it seemed surrounded by a cloud. No ashes were observed on this date. He arrived at Barbados on May 14, and early in the morning of that day 1½ inches of volcanic dust fell on the *Linnea's* deck.

## THE VARIATION OF TERRESTRIAL GRAVITY OVER THE OCEAN.

As is well known, the study of the mechanics of the earth's atmosphere has usually been complicated by an effort to take account of the so-called viscosity of the air. In an article in the American Meteorological Journal for 1893, it has been shown that the irregular variations of gravity are of equal importance with viscosity. Meteorologists are therefore interested in every effort to determine the actual force of gravity, and in the Monthly Weather Review for 1895, we have given the results of the work of the Coast and Geodetic Survey, so far as it relates to the surface of the United States. Up to the present time although the force of gravity has been measured on small islands in the ocean, yet nothing has been known as to its value at the surface of the ocean far from land. On this point our first knowledge is that given by F. R. Helmert, Director of the Royal Geodetic Institution at Berlin. In his annual report for April, 1902, he says:

The measurements of relative gravity on the ocean, as planned by myself, following Mohn's method of comparison of mercurial barometers and boiling point thermometers, has been carried out after thorough preparatory work by Dr. Hecker, along the line Hamburg-Lisbon-Rio Janeiro-Lisbon, with the assistance of the Committee on International Geodesy and the allowance of free passage on the part of the Hamburg-South American Steamship Association in the months July-October, 1901. Although the mean error of observation for a complete series (which consists of many determinations with four barometers and six thermometers during a morning or an afternoon) is much larger than the corresponding error in the case of pendulum observations, namely, about plus or minus 0.028 centimeters per second in the value of the acceleration of gravity, still it was established that on the deep ocean the acceleration of gravity certainly differs only a very few hundredths of a centimeter from that in the shallow sea near the coast, being perhaps 0.032 centimeters smaller. It can therefore no longer be maintained that the large value of $g$ observed on the small oceanic islands extends over the ocean itself, and as little can the reverse be maintained, namely, that the apparent defect of mass, in the space occupied by the sea makes itself felt by a great diminution of $g$ relative to that on land.

In connection with the results of Nansen's polar expedition, in the northern Polar Sea, Hecker's determinations add to the probability of the general truth of the equilibrium theory of the earth's crust, as explained by Pratt. Further details are given in the Sitzungsberichte of the Berlin Academy, February, 1902, as also in the report of the work of the Central Bureau of International Geodesy for 1901. As to the accuracy of the new boiling point thermometer, see the Zeitschrift für Instrumentenkunde, 1901, p. 133.—*C. A.*

## A METEOROLOGICAL LIBRARY.

If any observer wishes to acquire a very complete library of about 2,000 volumes and 3,000 pamphlets, mostly on meteorology and magnetism, he will do well to address "Madame R. von Wild, Englisch viertel No. 56, Zurich, Switzerland."

## CORRIGENDA.

In the Monthly Weather Review for June, 1902, page 309, column 1, make lines 11 and 12 read as follows:

$$v\varpi = -\frac{c}{2}\varpi^2 z = 2g\frac{\varpi z}{v} = \varpi u z = -\frac{\varpi^2 w}{2} = \text{constant},$$

by 307 and 308, introducing the value $v^2 = 2gz$.

In line 13, dele "not."

Make lines 15 and 16 read as follows:

492. Case I. $$v\varpi = -\frac{\lambda}{k-c}\frac{c}{2}\varpi^2 z = \text{const.}$$

Case II. $$v\varpi = -\frac{\lambda}{k}cz = \text{const.}$$

In line 20, change "these" to "the."

Make line 21 read "values in equation 490."

In line 22 insert "Case I" after "493" and between lines 22 and 23 insert the following:

Case II. $$\frac{\partial u}{\partial \varpi} + \frac{u}{\varpi} + \frac{\partial w}{\partial z} = +\frac{c}{\varpi^2} - \frac{c}{\varpi^2} + 0 = 0.$$

Page 307, make equation 519 read as follows:

519. $$-\frac{1}{\rho}\frac{\partial p}{\partial x} = -\frac{1}{\rho}\sigma_m\frac{\partial B}{\partial x} = -\frac{1}{\rho}\frac{\sigma_m}{111\,111}G = -\frac{0.12237G}{\rho}.$$

($G$ is in meters.)

# THE WEATHER OF THE MONTH.

By W. B. Stockman, Forecast Official, in charge of Division of Records and Meteorological Data.

## CHARACTERISTICS OF THE WEATHER FOR JULY.

The cloudiness was everywhere above the average (decidedly so in the southern slope region) except in the South Atlantic States, Ohio Valley and Tennessee, lower Lake region, the southern Plateau region, North Dakota, Missouri Valley, and the middle Pacific coast region, in which districts the departures ranged from —0.2 to —0.7. The relative humidity was normal in North Dakota; below, from 3 per cent to 7 per cent, in the South Atlantic and east Gulf States, the Florida Peninsula, and the southern Plateau and north Pacific and middle Pacific regions; elsewhere it was above the normal, in values ranging from 1 per cent to 9 per cent. The precipitation was normal in the middle Pacific coast region; below in the Atlantic and east Gulf States, Florida Peninsula, North Dakota, the middle slope, and southern Plateau regions, with departures ranging from —0.3 inch to —3.00 inches; elsewhere it was above the mean, with values ranging from +0.1 inch to +2.3 inches. The temperature was above the normal, in daily values of from +0.1° to +1.6° in the Middle Atlantic, South Atlantic and east Gulf States, Florida Peninsula, Tennessee and the Ohio Valley, Lake region, upper Mississippi Valley, and the middle Pacific region; elsewhere it was below, decidedly so in New England and the Plateau and middle slope regions, where the daily departures amounted to from —2.1° to —3.7°. Strong winds were infrequent but where they occurred, as a rule, the velocities were unusually high.

## PRESSURE.

The distribution of monthly mean pressure is shown graphically on Chart IV and the numerical values are given in Tables I and VI.

The area inclosed within the isobar of 30.00 inches of monthly mean pressure included the Middle Atlantic, South Atlantic, east Gulf, and eastern part of the west Gulf States, the central Mississippi and Ohio valleys and the lower Lake region; also the western parts of Washington and Oregon and northwestern California. The highest monthly mean pressures reported were but slightly above 30.05 inches, and occurred